

Proceedings

A Potential Role of Hypoxia-Inducible Factor (Hif-1) Alpha in Taravana Syndrome †

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Abstract: The number of subjects who practice recreational breath-hold diving is increasing; therefore there is a growing need to know the adaptations that this sport could have on the health of the participants. They are exposed to an increased hyperbaric pressure and low temperature that cause change in arterial blood gases and induced a human diving response which includes increased arterial blood pressure, reduced cardiac output, bradycardia and peripheral vasoconstriction. Start on the matter that these adaptations are still not fully understood, we decided to investigate some biomarkers that should be involved in this process starting to analyse Hypoxia-inducible factor 1 alpha (HIF-1 α). We enrolled in our study fifteen healthy free divers from Marsala's area, Sicily, who practiced this activity for more than five years. We asked them to perform five consecutive dives at twenty meters, without permanence on the bottom, with free recovery between the different dives. A baseline venous blood sample was taken immediately after surfacing from the 5th dive (less than 3 min). The samples were stored to -80 until the analysis were done using ELISA method. The results showed that comparing HIF-1 α value before and after the dives, there were a change in the concentration. In conclusion, the Hypoxia-inducible factor 1 alpha can be considered co-responsible for various phenomena, certainly not with pathological destinies, but rather working with "adaptation" phenomena to this type of activity. These are just the preliminary results that need further investigations to be confirmed.

1. Introduction

Is already know that physical activity (PA) exert a positive effect on brain health improving cognitive processes as well as the quality of life (Di Liegro et al., 2020; Amato et al., 2018). However, some sports could have a high impact like anerobic lactic activity, overall when is performed in hypoxia environment (Proia et al, 2019). Breath-hold diving is an activity that need an adaptation at biochemical and physiological level, depending on the depth at which it is performed (Lindholm et al, 2009). These adaptions includes increased arterial blood pressure, reduced cardiac output, bradycardia and peripheral vasoconstriction (Bosco et al, 2018; Heusser et al, 2009).

Starting from this knowledge, the aim of our study was to analyze some biomarkers as responsible of this adaption.

2. Methods

Fifteen healthy free divers from Marsala's area, Sicily, who practiced this activity for more than five years were involved in our study. They performed five consecutive dives at twenty meters, without permanence on the bottom, with free recovery between the different dives. A baseline venous blood sample was taken immediately after surfacing from the 5th dive (less than 3 min). The samples were stored to -80 until the analysis were done using ELISA method. (Figure 1).

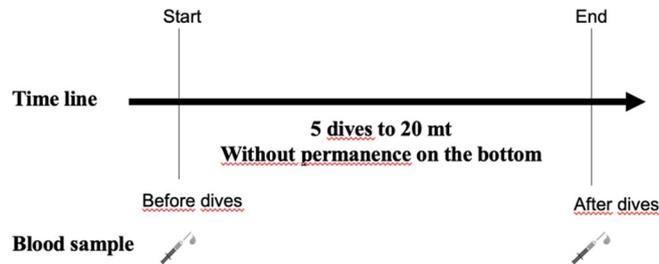


Figure 1. The samples were stored to -80 until the analysis were done using ELISA method.

3. Statistical analysis

T Test was applied to evaluate differences between the assessment pre and post dives (useful for determining where significant differences occur between pairs of data). Alpha significance level was set at 5% (and was adjusted for multiple comparisons). Statistica Software, ver. 13.0 was used for the analysis.

4. Results and Discussion

As regard the hematological biomarkers analyzed before and after five dives, the results highlighted that one of the candidates to be responsible of the adaptations to the recreational breath-hold diving is the Hypoxia-inducible factor 1 alpha (HIF-1 α). In fact, compare the results from before and after dives, there is the evidence in a change of his level. It's possible that this factor acts not in a direct way but trough the interaction with other factors. Further investigation will need to better understand the pathway in which HIF-1 α could be involved, perhaps by increasing the sample size.

5. Conclusion

In conclusion, the Taravana syndrome is already unknow and deep investigations are needed to better understand if the HIF-1 α factor is correlate with the adaption to the dives, which take place following the continuous immersions.

References

1. Liegro, D.; Schiera, G.; Proia, P.; Di Liegro, C.M.; Di Liegro, I. Physical Activity and Brain Health. *Genes* **2019**, *10*, 720, doi:10.3390/genes10090720.
2. Amato, A.; Baldassano, S.; Cortis, C.; Cooper, J.; Proia, P. Physical activity, nutrition, and bone health. *Hum. Mov.* **2018**, *19*, 1–10, doi:10.5114/hm.2018.77318.
3. Proia, P.; Amato, A.; Contrò, V.; Monaco, A.L.; Brusa, J.; Brighina, F.; Messina, G. Relevance of lactate level detection in migrane and fibromyalgia. *Eur. J. Transl. Myol.* **2019**, *29*, 8202, doi:10.4081/ejtm.2019.8202.
4. Lindholm, P.; Lundgren, C.E.G. The physiology and pathophysiology of human breath-hold diving. *J. Appl. Physiol.* **2009**, *106*, 284–292, doi:10.1152/jappphysiol.90991.2008.
5. Bosco, G.; Rizzato, A.; Martani, L.; Schiavo, S.; Talamonti, E.; Garetto, G.; Paganini, M.; Camporesi, E.M.; E Moon, R. Arterial Blood Gas Analysis in Breath-Hold Divers at Depth. *Front. Physiol.* **2018**, *9*, 1558, doi:10.3389/fphys.2018.01558.
6. Heusser, K.; Dzamonja, G.; Tank, J.; Palada, I.; Valic, Z.; Bakovic, D.; Obad, A.; Ivancev, V.; Breskovic, T.; Diedrich, A.; et al. Cardiovascular Regulation During Apnea in Elite Divers. *Hypertens.* **2009**, *53*, 719–724, doi:10.1161/hypertensionaha.108.127530.